CLAIMS:

1. A method of encoding a latent image, the method comprising:

a) providing a latent image to be encoded, the latent image having a plurality of latent image elements, each latent image element having a visual characteristic which takes one of a predetermined set of values;

b) providing a secondary pattern having a plurality of secondary image elements, the secondary pattern being capable of decoding said latent image once the latent image has been encoded;

c) relating the latent image elements to the secondary image elements; and

d) forming a primary pattern comprising a plurality of primary image elements which correspond to said secondary image elements displaced in accordance with the value of the visual characteristic of the latent image elements to which said secondary image elements are related.

2. A method as claimed in claim 1 comprising selecting said visual characteristics to be a set of gray-scale values.

3. A method as claimed in claim 1 comprising selecting said visual characteristics to be saturation values of the hue of the latent image elements.

4. A method as claimed in claim 1 comprising providing a secondary pattern comprising rectangular groups of image elements arranged in such a way that if the secondary pattern were superimposed upon itself at a certain displacement it would eclipse it's own image.

5. A method as claimed in claim 4, comprising providing a secondary pattern comprising a rectangular

array consisting of a plurality of opaque vertical lines, each line being N image elements wide and separated by transparent lines N image elements wide whereby said secondary pattern can be used to encode a latent image having up to N + 1 different gray-scale values.

6. A method as claimed in claim 1 wherein said image elements are pixels.

7. A method as claimed in claim 6 wherein the number of visual characteristics is chosen on the basis of the printing technique to be used to print the primary pattern.

8. A method as claimed in claim 7, wherein the number of visual characteristics (S) is determined in accordance with the equation:

$S = (WR/25.4X) + 1$, where:

W is the to be printed width of the primary pattern;
R is the printer resolution in image dots per square inch; and
X is the width of the primary pattern in pixels.

9. A method as claimed in claim 1 wherein relating the latent image elements to the secondary image elements comprise associating the latent image elements with secondary image elements, whereafter the secondary image elements are displaced in dependence on the value of the visual characteristic of the latent image elements with which they are associated.

10. A method as claimed in claim 1 wherein relating the latent image elements to the secondary image elements comprises separating the latent image into a plurality of masks corresponding to each value of the visual characteristic, forming a plurality of displaced partial secondary patterns, and using the masks to modify the

plurality of displaced partial secondary patterns and combining the modified displaced partial patterns to form said primary pattern.

11. A method as claimed in claim 1 wherein said secondary and primary image elements are arranged in a generally rectangular array.

12. A method as claimed in claim 11 wherein said secondary image elements are displaced along an axis of the rectangular array.

13. A method as claimed in claim 12 wherein said secondary image elements are displaced along an axis of the rectangular array and there are S different values of the visual characteristic, and wherein secondary image elements associated with latent image elements having a first value of the visual characteristic are displaced horizontally by 1 image element, and each subsequent visual characteristic is displaced by a further image element so that the S^{th} shade is displaced by S image elements.

14. A method as claimed in claim 12 wherein said secondary image elements are displaced along an axis of the array and there are S different values of the visual characteristic, and wherein secondary image elements associated with latent image elements having a first value of the visual characteristic are displaced in accordance with the equation: displacement (D) = $(N-1)* [(S-S_{min})/(S_N-S_{min})]$; where S is the value of the visual characteristic being displaced, S_{min} is the sparsest density value of the visual characteristic and S_N is the densest value of the visual characteristic.

15. A method as claimed in claim 1 further comprising forming the latent image from an original image by image

processing an original image to reduce the number of values of the visual characteristic in the original image to the number of values required in the latent image.

16. A method as claimed in claim 1 wherein displacing said secondary image elements comprises displacing image elements of different portions of said secondary pattern in different directions.

17. A method of encoding a plurality of latent images, the method comprising:

a) providing a plurality of latent images to be encoded, each latent image having a plurality of latent image elements, each latent image element having a visual characteristic which takes one of a predetermined set of values;

b) providing at least one secondary pattern, each at least one secondary pattern having a plurality of secondary image elements, each secondary pattern being capable of decoding one or more of said latent images once the latent images have been encoded;

c) relating the latent image elements to the secondary image elements of the secondary pattern which is to decode the latent image;

d) forming a primary pattern for each primary pattern comprising a plurality of primary image elements which correspond to said secondary image elements displaced in accordance with the value of the visual characteristic of the latent image elements to which said secondary image elements are related; and

e) combining said primary patterns at angles to one another to form a composite primary pattern encoding each of said latent images.

18. A method as claimed in claim 17 wherein a single secondary pattern encodes all of the latent images.

19. A method as claimed in claim 17, wherein different secondary patterns are provided for each of said latent images.

20. A method as claimed in claim 19, wherein said different secondary patterns are configured to encode different numbers of visual characteristics and said latent images have different numbers of visual characteristic to one another.

21. A method as claimed in claim 17 wherein said primary patterns are combined to provide maximum contrast between said primary patterns.

22. A method as claimed in claim 17 wherein said primary patterns are combined to provide contrast between said primary patterns while avoiding self-decoding effects.

23. A method as claimed in claim 17 wherein said primary patterns are combined at 5-10 degrees from the angle which provides maximum contrast between said primary patterns.

24. A method as claimed in claim 17 wherein there are two primary patterns combined at 90 degrees to one another.

25. A method as claimed in claim 17 wherein there are three primary patterns, and the angles between neighboring images is in the range of 35 to 55 degrees.

26. A method as claimed in claim 17 wherein one or more of said primary patterns is converted to a negative before said primary patterns are combined.

27. A method as claimed in claim 17 wherein where

said primary patterns overlap, image elements are combined to select for a combination of contrast and concealment.

28. A method as claimed in claim 17, wherein said primary patterns are combined by summing together the visual characteristic of collocated image elements to obtain a combined primary pattern and dithering the combined primary pattern to obtain a black and white composite primary pattern.

29. A primary pattern encoding a latent image, said primary pattern comprising:

a plurality of primary image elements which can be decoded by a secondary pattern comprising a plurality of secondary image elements, said primary image elements being displaced relative to respective ones of said secondary image elements, the displacement being determined on the basis of the value of the visual characteristic of latent image elements related to respective ones of said secondary image elements.

30. A primary pattern method as claimed in claim 29 wherein said visual characteristics are a set of gray-scale values.

31. A primary pattern as claimed in claim 29 wherein said visual characteristics are saturation values of the hue of the latent image elements.

32. A primary pattern as claimed in claim 29 wherein said secondary pattern comprises rectangular groups of image elements arranged in such a way that if the secondary pattern were superimposed upon itself at a certain displacement it would eclipse it's own image.

33. A primary pattern as claimed in claim 29 wherein said secondary pattern comprising a rectangular array

consisting of a plurality of opaque vertical lines, each line being N image elements wide and separated by transparent lines N image elements wide whereby said secondary pattern can be used to encode a latent image having up to N + 1 different gray-scale values.

34. A primary pattern as claimed in claim 29 wherein said image elements are pixels.

35. A primary pattern as claimed in claim 34 wherein the number of visual characteristics (S) is determined in accordance with the equation:

$$S = (WR/25.4X) + 1$$, where:

W is the to be printed width of the primary pattern;
R is the printer resolution in pixels per square inch; and
X is the width of the primary pattern in pixels.

36. A primary pattern as claimed in claim 29 wherein and primary image elements are arranged in a generally rectangular array.

37. A primary pattern as claimed in claim 36 wherein said secondary image elements are displaced along an axis of the rectangular array.

38. A primary pattern as claimed in claim 29 wherein there are S different values of the visual characteristic, and wherein secondary image elements associated with latent image elements having a first value of the visual characteristic are displaced horizontally by 1 image element, and each subsequent visual characteristic is displaced by a further image element so that the S^{th} shade is displaced by S image elements.

39. A primary pattern as claimed in claim 37 wherein said secondary image elements are displaced along an axis of the array and there are S different values of the

visual characteristic, and wherein secondary image elements associated with latent image elements having a first value of the visual characteristic are displaced in accordance with the equation: displacement (D) = (N-1)* $[(S-S_{min})/(S_N- S_{min})]$; where S is the value of the visual characteristic being displaced, S_{min} is the sparsest density value of the visual characteristic and S_N is the densest value of the visual characteristic.

40. A primary pattern as claimed in claim 29 wherein primary image elements of different portions of said primary pattern are displaced in different directions relative to said secondary image elements.

41. A primary pattern as claimed in claim 29 which constitutes a security device.

42. A primary pattern as claimed in claim 29 which constitutes a novelty item.

43. A primary pattern as claimed in claim 29 which forms part of a document or instrument.

45. A primary pattern as claimed in claim 29 wherein said primary pattern is embossed on a polymer substrate.

45. A composite primary pattern encoding a plurality of latent images, said composite primary pattern comprising:

a plurality of superimposed primary patterns, each angled relative to one another, each primary pattern comprising a plurality of primary image elements which can be decoded by a secondary pattern comprising a plurality of secondary image elements, said primary image elements being displaced relative to respective ones of said secondary image elements, the displacement being determined on the basis of the value of the visual

characteristic of latent image elements related to respective ones of said secondary image elements.

46. A composite primary pattern as claimed in claim 45 wherein the same secondary pattern is capable of decoding each of the latent images.

47. A composite primary pattern as claimed in claim 45 wherein different secondary patterns are required to decode each of said latent images.

48. A composite primary pattern as claimed in claim 47, wherein said different secondary patterns encode different numbers of visual characteristics and said latent images have different numbers of visual characteristic to one another.

49. A composite primary pattern as claimed in claim 45 wherein said primary patterns are combined to provide maximum contrast between said primary patterns.

50. A composite primary pattern as claimed in claim 45 wherein said primary patterns are combined to provide contrast between said primary patterns while avoiding self-decoding effects.

51. A composite primary pattern as claimed in claim 45 wherein said primary patterns are combined at 5-10 degrees from the angle which provides maximum contrast between said primary patterns.

52. A composite primary pattern as claimed in claim 45 wherein there are two primary patterns combined at 90 degrees to one another.

53. A composite primary pattern as claimed in claim 45 wherein there are three primary patterns, and the

angles between neighboring images is in the range of 35 to 55 degrees.

54. A composite primary pattern as claimed in claim 45 wherein one or more of said primary patterns is converted to a negative before said primary patterns are combined.

55. A composite primary pattern as claimed in claim 45 wherein where said primary patterns overlap, image elements are combined to select for a combination of contrast and concealment.

56. A composite primary pattern as claimed in claim 45 wherein said primary patterns are combined by summing together the visual characteristic of collocated image elements to obtain a combined primary pattern and dithering the combined primary pattern to obtain a black and white composite primary pattern.

57. A composite primary pattern as claimed in claim 45 which constitutes a security device.

58. A composite primary pattern as claimed in claim 45 which constitutes a novelty item.

59. A composite primary pattern as claimed in claim 45 which forms part of a document or instrument.

60. A composite primary pattern as claimed in claim 45 embossed on a polymer substrate.